5.9 **FIELD**

The size and shape of a field are normally fixed by landscape conditions.

To evaluate the effect of field size and shape on erosion several examples are run with the same management file (TEST-FT.MAN) that is made up of 12 **HARROW_S** operations on the first of each month. (Figure 5.9.1 has been compiled to show what the **DOABLE SCREEN** should look like.) There is no residue or growing crop for any of the dates entered. The harrow is used each month with **Random Roughness** = 0.1 and no ridges (Figure 5.9.2) .

Figure 5.9.1

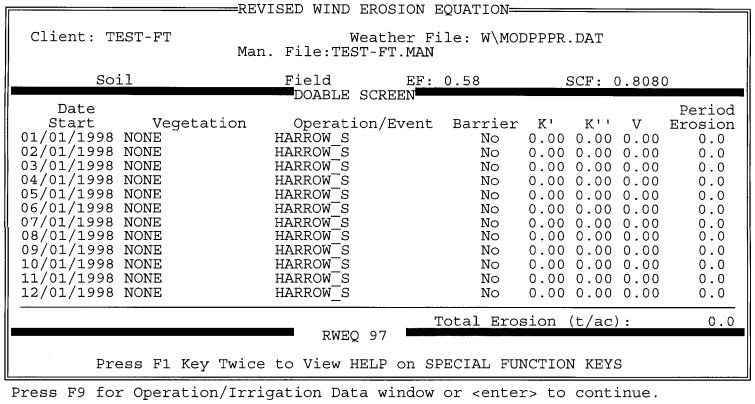
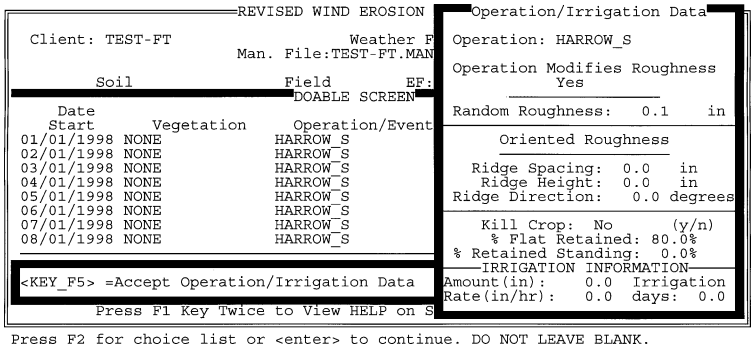


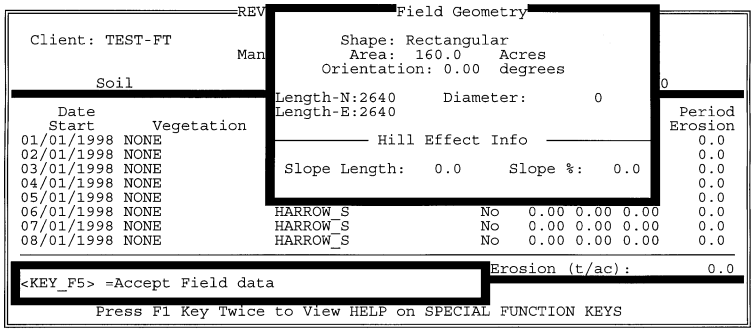
Figure 5.9.2



Fryrear, D.W., Ali Saleh, J.D. Bilbro, H.M. Schomberg, J.E. Stout, and T.M. Zobeck. 1998. Revised Wind Erosion Equation (RWEQ). Wind Erosion and Water Conservation Research Unit, USDA-ARS, Southern Plains Area Cropping Systems Research Laboratory. Technical Bulletin No. 1. Internet address: http://www.csrl.ars.usda.gov/wewc/rweq.htm

The soil properties are not changed. These examples are all run with a rectangular field. The area of the field, the orientation of the field and the length of the side running closer to north (Length-N) are varied. The changes are made in the **`Field Geometry`** window (Figure 5.9.3) and then erosion is calculated.

Figure 5.9.3



Erosion is estimated with two different weather files for each example. One weather file is from Dodge City, Kansas (Table 5.9.1) . The other weather file is the Big Spring, Texas file modified to show a prevailing wind erosion direction of 0° , a preponderance of 10, and a positive parallel ratio of 1 (Table 5.9.2).

Table 5.9.1 Dodge City, Kansas weather file - KS13985.DAT

```
# 13985 USA KS DODGE_CITY
  37 46 N 99 58 W 796 19610421 19781231 AGW  115 88
   6.85  7.07  7.90  7.94  7.43  7.20  6.70  6.42  6.77  6.88  6.82  6.94
   2.65  2.55  2.56  2.60  2.73  2.66  2.85  2.86  2.66  2.69  2.65  2.72
   1.19  1.18  1.15  1.12  1.11  1.09  1.08  1.08  1.10  1.13  1.16  1.18
      0     0     0   180   180   180   180   180   180   180     0     0
    6.6   3.4   2.7   3.1   3.6   5.8   4.1   4.7   5.7   5.5   3.4   3.8
   0.81  0.89  0.69  0.58  0.73  0.89  0.95  0.86  0.64  0.55  0.65  0.75
    1.3   1.0    .8    .7    .9   1.3    .8   1.0   1.1    .9   1.2   1.0
    6.8  10.6  15.2  21.7  26.5  32.1  35.0  34.3  29.3  23.4  14.3   8.7
   -6.9  -4.1  -0.1   6.3  11.7  17.0  19.7  18.6  14.0   7.7   0.2  -4.8
   -6.6  -4.0  -2.4   3.8  10.9  15.4  17.3  16.1  11.8   6.2  -0.5  -4.6
    323   373   539   647   733   801   825   734   610   472   352   298
     14    23    37    41    91    98    77    74    64    47    27    18
    3.1   3.5   4.7   4.8   7.7   7.0   6.3   5.7   5.0   3.5   3.4   2.9
   10.7  30.4   6.3   0.0   0.0   0.0   0.0   0.0   0.0   0.0   5.8  13.8
      0     0    19    39   195   469   469   332   254    97    58    19
    0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
  37 16 N 99 19 W 79.8 KS COLDWATER A
```

Table 5.9.2 Modified Big Spring, Texas weather file - MODPPPR.DAT

```
#  BIG_SPRING, TEXAS    DIRECTION=0  PREPOND=10   POSIT/PARALL/RATIO=1
  32 14 N 101 30 W 784 19590507 19701231 AGA  95 91
   5.91  6.50  7.30  7.25  7.05  6.80  5.97  5.52  5.68  5.93  5.83  5.70
   2.13  2.15  2.35  2.47  2.65  2.68  2.82  2.61  2.47  2.26  2.15  2.12
   1.17  1.15  1.13  1.10  1.09  1.08  1.07  1.08  1.09  1.11  1.14  1.16
      0     0     0     0     0     0     0     0     0     0     0     0
     10    10    10    10    10    10    10    10    10    10    10    10
      1     1     1     1     1     1     1     1     1     1     1     1
    8.0   6.6   3.3   3.6   3.2   3.8   4.0   4.7   6.1   7.2   7.8   9.5
   13.6  16.3  20.8  25.9  29.8  33.7  34.7  34.2  30.6  25.7  19.0  15.3
   -1.3   1.1   4.8  10.3  15.2  19.5  21.6  20.9  17.3  11.4   4.5   0.4
   -3.1  -1.3  -1.0   4.0  10.5  14.9  16.0  15.2  13.7   8.5   1.9  -1.6
    378   442   612   699   810   844   845   766   668   527   411   357
     17    15    17    35    76    49    47    45    67    42    16    14
    3.5   3.2   2.7   3.8   6.2   4.6   4.8   5.0   5.5   4.5   2.9   2.7
    0.7   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   2.5
      0     0    16    16   226   371   226   226   226   226    64    16
    0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
  32 13 N 101 30 W 1.9 TX BIG SPRING WB AP
```

As field length increases, the quantity of material being transported from the soil surface to a height of 2 meters (78.4") rapidly increases until the wind has attained 63.2% of its maximum transport capacity. The field length where the wind contains 63.2% of its capacity is called critical field length and is designated *s*. At *s* the average upwind soil loss is maximum. As field length decreases below *s* or is greater than *s*, average soil loss decreases.

Table 5.9.3 Comparison of field length and field size.

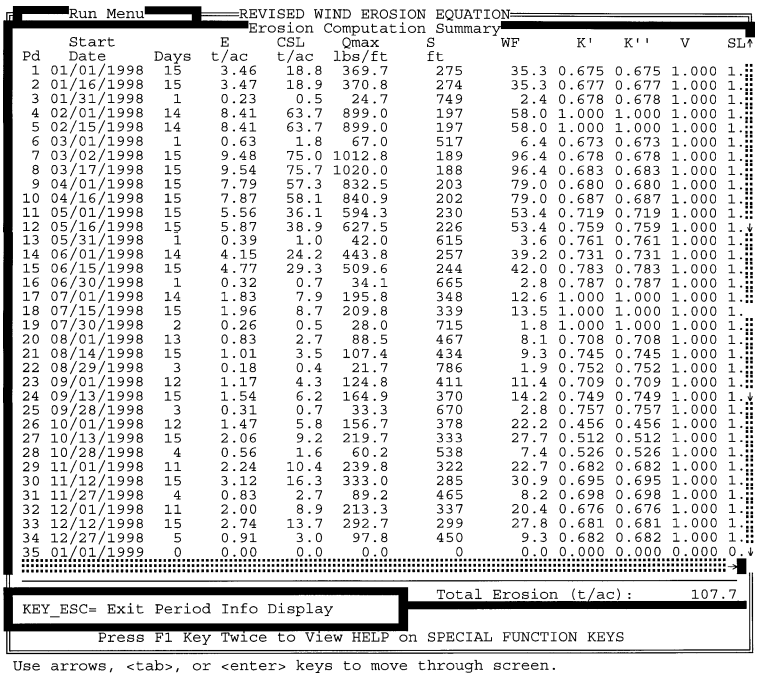
Field orientation *degrees*	Length-N *feet*	Field size *acres*	Erosoin estimate using KS13985.DAT *t/ac*	Erosoin estimate using MODPPPR.DAT *t/ac*
0	2640	160	147	108
0	2640	20	311	162
0	400	20	670	593
0	330	20	709	651
0	165	10	654	615
0	100	6	563	478
1	100	6	525	431
10	100	6	675	512
22	100	6	745	558
45	100	6	725	600
89	100	6	283	187
90	100	6	242	146

In these examples as the field width decreases from 2640 to 330 feet, the soil loss increases dramatically. As field length decreases from 330 to 100 feet, soil loss decreases. From the data in Table 5.9.3 the field width with maximum annual soil erosion is about 330 feet.

From the Tabular Output (Table 5.9.4) using the w\MODPPPR.DAT weather file and the 160 acre field with Length-N = 2640, the *s* value varies from 197 to 786 feet.

For modifying field length to be effective in reducing soil erosion, the field length parallel to the dominant wind directrion must be less than the critical field length (*s*). This explains why some strip cropping systems have an accumulation of eroded soil at the upwind edge of each strip.

Figure 5.9.4 Tabular output from TEST-FT.MAN and MODPPPR.DAT with field orientation = 0°, length-N = 2640 feet, and field size = 160 acres.



Pd	Start Date	Days	E t/ac	CSL t/ac	Qmax lbs/ft	S ft	WF	K'	K''	V	SL
1	01/01/1998	15	3.46	18.8	369.7	275	35.3	0.675	0.675	1.000	1.
2	01/16/1998	15	3.47	18.9	370.8	274	35.3	0.677	0.677	1.000	1.
3	01/31/1998	1	0.23	0.5	24.7	749	2.4	0.678	0.678	1.000	1.
4	02/01/1998	14	8.41	63.7	899.0	197	58.0	1.000	1.000	1.000	1.
5	02/15/1998	14	8.41	63.7	899.0	197	58.0	1.000	1.000	1.000	1.
6	03/01/1998	1	0.63	1.8	67.0	517	6.4	0.673	0.673	1.000	1.
7	03/02/1998	15	9.48	75.0	1012.8	189	96.4	0.678	0.678	1.000	1.
8	03/17/1998	15	9.54	75.7	1020.0	188	96.4	0.683	0.683	1.000	1.
9	04/01/1998	15	7.79	57.3	832.5	203	79.0	0.680	0.680	1.000	1.
10	04/16/1998	15	7.87	58.1	840.9	202	79.0	0.687	0.687	1.000	1.
11	05/01/1998	15	5.56	36.1	594.3	230	53.4	0.719	0.719	1.000	1.
12	05/16/1998	15	5.87	38.9	627.5	226	53.4	0.759	0.759	1.000	1.
13	05/31/1998	1	0.39	1.0	42.0	615	3.6	0.761	0.761	1.000	1.
14	06/01/1998	14	4.15	24.2	443.8	257	39.2	0.731	0.731	1.000	1.
15	06/15/1998	15	4.77	29.3	509.6	244	42.0	0.783	0.783	1.000	1.
16	06/30/1998	1	0.32	0.7	34.1	665	2.8	0.787	0.787	1.000	1.
17	07/01/1998	14	1.83	7.9	195.8	348	12.6	1.000	1.000	1.000	1.
18	07/15/1998	15	1.96	8.7	209.8	339	13.5	1.000	1.000	1.000	1.
19	07/30/1998	2	0.26	0.5	28.0	715	1.8	1.000	1.000	1.000	1.
20	08/01/1998	13	0.83	2.7	88.5	467	8.1	0.708	0.708	1.000	1.
21	08/14/1998	15	1.01	3.5	107.4	434	9.3	0.745	0.745	1.000	1.
22	08/29/1998	3	0.18	0.4	21.7	786	1.9	0.752	0.752	1.000	1.
23	09/01/1998	12	1.17	4.3	124.8	411	11.4	0.709	0.709	1.000	1.
24	09/13/1998	15	1.54	6.2	164.9	370	14.2	0.749	0.749	1.000	1.
25	09/28/1998	3	0.31	0.7	33.3	670	2.8	0.757	0.757	1.000	1.
26	10/01/1998	12	1.47	5.8	156.7	378	22.2	0.456	0.456	1.000	1.
27	10/13/1998	15	2.06	9.2	219.7	333	27.7	0.512	0.512	1.000	1.
28	10/28/1998	4	0.56	1.6	60.2	538	7.4	0.526	0.526	1.000	1.
29	11/01/1998	11	2.24	10.4	239.8	322	22.7	0.682	0.682	1.000	1.
30	11/12/1998	15	3.12	16.3	333.0	285	30.9	0.695	0.695	1.000	1.
31	11/27/1998	4	0.83	2.7	89.2	465	8.2	0.698	0.698	1.000	1.
32	12/01/1998	11	2.00	8.9	213.3	337	20.4	0.676	0.676	1.000	1.
33	12/12/1998	15	2.74	13.7	292.7	299	27.8	0.681	0.681	1.000	1.
34	12/27/1998	5	0.91	3.0	97.8	450	9.3	0.682	0.682	1.000	1.
35	01/01/1999	0	0.00	0.0	0.0	0	0.0	0.000	0.000	0.000	0.